THE "SANTOS-DUMONT NO. 5."

The first fifteen days of July, 1901, have been signalized by two great events which may well be said to make two red-letter days in the history of the world, and in each case the conquest has been one of science, and so far, the Twentieth Century has proved itself in no way inferior to the Nineteenth. Within an interval of only ten days the submarine boat "Gustave Zédé" has made wonderful trials in Corsica, remaining hours under water, and the dirigible balloon of M. Santos-Dumont made a most successful flight at Paris.

The balloon of M. Santos-Dumont, which made a trip from St. Cloud to the Eiffel Tower and return, is the fifth aerostat which this very clever young Brazilian engineer has constructed, to solve the problem of dirigibility. He was inspired by the works of his predecessors, particularly by those of M. Giffard and of MM. Renard and Krebs. M. Santos-Dumont uses for his source of power a petroleum motor, light and powerful, of the Dion-Bouton type, so much employed for automobiles. On September 18, 1898, he launched the "Santos-Dumont No. 1," driven by a motor of this kind, and since that time he has not ceased to experiment and perfect his plans for aerial navigation, and his last venture has proved highly successful. The balloon is cylindrical and is covered with silk, the extremities being pointed. It is 111 feet long and its capacity is 19,300 cubic feet. Suspended some 35 or 40 feet below the balloon proper is a light framework whose profile very much resembles that of the balloon proper. The section of this framework is triangular. It is formed of three long pieces of wood secured together at the ends and strengthened by cross-bracing. Steel wires also assist in preventing the framework from being deformed by strains. The framework supports a four-cylinder 16 horse power motor, the fuel reservoir, the shaft and the propeller. The engine is placed well toward one end and the aeronaut rides in a light basket toward the other end. Here he has under his control all of the machinery for maneuvering the balloon, also the ballast and the guide-rope. The respective positions of the various weights have only been determined after many experiments. Its equilibrium is perfect, and this assures its horizontality and an equal tension on the suspenders. This explains why the aeronaut is so far separated from his motor. The framework is attached directly to the balloon by a system of strong piano wires which offer no resistance to the wind. The wires cannot be distinguished when the balloon has attained any altitude. The propeller is 14 feet in diameter and is composed of two wings of wood and steel, covered with silk and highly varnished. It attains a speed of 150 revolutions a minute. The steering device, or rudder, is of silk and is placed between the balloon and the framework, and above the propeller. The balloon is inflated with hydrogen, and in order to maintain at all times a tension on the envelope, that is to say, a perfect inflation, a compensating balloon filled with air is placed in the interior. This is inflated automatically, as required. A small compressor actuated by the motor serves to give the necessary pressure in the small internal balloon, to which the air is conducted by tubing.

An 80-pound guide-rope is suspended under the framework. With its aid the necessary inclination is obtained to effect the movements of ascent or descent. Such, in brief, are the apparatus and methods employed by M. Santos-Dumont.

The aeronaut made his remarkable journey on the 12th of July, starting at 3 o'clock in the morning from the park of the Aéro Club at St. Cloud. The guide-rope was held by the workmen until the race-track at Longchamps was reached, and there the balloon was cast off. There was no difficulty in obtaining an altitude of 500 to 700 feet. The balloon turned around several times, and then M. Santos-Dumont took a tour of the Bois de Boulogne and came back to his point of departure. Encouraged by his success, at 7 o'clock the following morning he turned toward the Eiffel Tower, but owing to the height of the garden of the Trocadero he was obliged to stop to repair a part of his rudder. He then doubled the Eiffel Tower and returned to St. Cloud without accident, after a trip whose duration was more than an hour. The next day an attempt was made to obtain the prize of 100,000 francs offered by M. Deutsch in favor of the first aeronaut who started from St. Cloud, doubled the Eiffel Tower and returned to the starting place in thirty-five minutes.

At a quarter past 6 in the morning, the balloon was got ready and inspected and a quarter of an hour later M. Santos-Dumont was in the basket, the motor was started, and the balloon commenced to rise. The exact time of the start, which was made in the direction of the Eiffel Tower, was 6:41, and everything seemed favorable for a good voyage. There was a light wind from the northward, which obliged the aeronaut to describe a large circle. Another cause of delay was that the motor worked unsatisfactorily, only three cylinders working in place of four, which, of course, rendered the speed defective. At 7 o'clock the "Santos-Dumont No. 5" doubled the Eiffel Tower just above the second platform. This evolution was accomplished with remarkable precision. The return was not so successful, owing to the continued trouble with the motor, and so much time was lost that it was impossible to claim the prize. The balloon had the same difficulty in returning to the balloon-house, the trouble this time being caused by some new sheds which had been constructed. The aeronaut decided to descend at Longchamps, and he recrossed the Seine, but the motor worked worse and worse, so that nothing remained but to descend. The balloon was deflated, and the guide-rope caught in the branches of some trees on the property of M. de Rothschild. Happily the aeronaut was not injured and the balloon was only slightly hurt. The damage was immediately repaired, and on July 29 M. Santos-Dumont made another ascent. He had arranged to make his promised trip over Paris in the afternoon, but he was obliged to abandon the idea, as he found that the motor was working badly. Still, in order not to disappoint the numerous visitors to St. Cloud, he gave a maneuvering exhibition over the Bois de Boulogne. Several ascents were made and the guide-rope frequently caught in the trees, but it

was released without any harm being done. All the visitors were astonished by the marvelous control the inventor had over the balloon. The weather was favorable and there was no wind. The motor was obviously at fault, as the screw was frequently at a standstill. For our engravings and the foregoing particulars we are indebted to L'Illustration.

AN UNIVERSAL ALPHABET.

By J. C. RUPPENTHAL, LL.B., Russell, Kan.

In the National Review of a few months ago, the Chinese Minister to England, Sir Chihchen Lofenglueh, in a thoughtful article, said: "The world is in want of a universal written language," and after adding that we are drifting to the Chinese way-symbolic language, adds: "For whether you know it or not, or wish it or not, you are drifting toward a universal language in obedience to the law of evolution." About the same time the American journals stated, as a news item: "There is now a conference of a European Academy of Science at Wiesbaden on the possibility of all nations adopting a uniform scientific and commercial language. They favor Latin for scientific and English for commercial use." A few years ago the students of Volapük had high hopes that their exact, scientific language would soon be the world-language that every person of average intelligence would know in addition to his mother-tongue.

In this age of electric communication and rapid transportation the "wide, wide world" of old has shrunk to inconsiderable bounds and all men are neighbors. The events of the last three years have brought this home to the American people as never before. The close inter-relations of the peoples of

M. SANTOS-DUMONT.

every part of the globe, and more especially our wider sphere in the Orient, as well as in the Antilles, have given us renewed interest in the matter of universal speech and impressed us with its importance and desirability to the diplomat, the statesman, the soldier, the merchant, the missionary, the traveler, and the scientist.

It is not lack of appreciation of an universal tongue—written, spoken, and understood everywhere—that has prevented Volapük and similar artificial languages from coming into general use. At least one reason may be found within the very name—Volapük. Here is an aspirant to the throne of the world, yet what is its name? No person whose mother-tongue is English, can tell, until he has been taught the pronunciation of the word Volapük. At the very threshold of the study, here was a great stumbling-block. With six sounds represented by o, seven by a, and five by u in our language (and the ü umlaut totally foreign), the first requisite in learning the new speech was to find out definitely the phonic values of the letters used. There are 252 possible pronunciations of the letters, v-o-l-a-p-ü-k, and 756 if the accent be varied.

The investigation of the principles of a progressive movement sometimes reveals the need of a primary reform to which the investigated movement is but secondary. Thus it appears that in attempting to establish an universal language, the beginning should be with the elementary sounds used in human speech, and the characters or letters representing such sounds. A simple, scientific, universal alphabet is needed in the making of an universal language, or the reformation and simplification of those existing. English, with its 26 signs used to represent from 40 to 45 different sounds, has especial need of an universal alphabet to simplify it and to extend its use, whether in Cuba, Luzon or elsewhere.

An universal alphabet should be based on the prin-

ciple of representing each sound by a single sign which should stand for one (and only one) simple elementary sound. Every sound made by the human voice and used, either alone or combined with other sounds, to express an idea, should have a character to represent it. Into such an alphabet all written languages, whether living or dead, could be transliterated. The dialects of unlettered races would find in this a written and printed form to meet every possible demand. No further sets of arbitrary characters would need to be devised, as has been done for the American Indian, African and South Sea tribes. To the aborigine, or to him whose vernacular is a local dialect, the universal alphabet would be as acceptable as though designed for his especial use, while to the scientist it would be an incalculable saving of valuable time and effort if he were not obliged to learn a new alphabet for each race or tribe. It may be remarked parenthetically that Prof. Richard T. Colburn, in his lecture on "Improvident Civilization," places diversity of languages among the "eight great wastes of vital force in our times."

The adoption of Occidental ways by the Japanese and the constant inroad of Western ideas in China—whether dismembered or intact—make it probable that the word-sign method in vogue among Mongolians will be superseded by something less complex. Will it be English?

The vast numbers of people who speak English, estimated to-day at 130,000,000; their wide dispersion over the globe; their extensive literature and numerous periodicals; the ceaseless advance of their speech over new territory and its adoption by ever-increasing hosts, place this once-insular language at the head in the march for universal lingual dominion. But even Chauvinists on the subject may see that this dream of supremacy is far from realization unless the illogical spelling of English—the quintessence of absurdity—is changed. The ghosts of departed sounds that now troop along as silent letters in most English words, the many characters and combinations standing for one sound, and the many sounds represented by a single letter, may be insuperable obstacles to the speedy acceptance of English by other nations. The New York Press said about two years ago: "English is becoming the language of the commercial world. China, Japan and Mexico have lately taken it up in the schools." (Now we must add Cuba, Porto Rico, and the Philippines.) "The queer and sometimes awkward features of English orthography are the only blocks to the general acceptance of our tongue in commercial dealings." At present an English speaking child must first learn a quadruple alphabet, consisting of capital and lower-case Roman letters, and large and small script—104 different characters which must be recognized at first sight—to say nothing of italics, black-letter and display type. The doorway into the temple of learning is almost choked with rubbish which even the smallest toddlers must climb over, or

"Knowledge to their eyes her ample page,

Rich with the spoils of time, will ne'er unroll."

The student now finds ten or more standard English dictionaries. In each he needs to learn a key to pronunciation—really a new alphabet—before he can freely and fully use the work.

A scientific universal alphabet would remedy all this, and from the outset would be the standard of pronunciation in all dictionaries of every language, until such time as the language itself (where written) would be transliterated, needing no indications of proper pronunciation other than the simple (universal) letters composing the word. To-day our newspapers and magazines rarely indicate the pronunciation of new words—even before they are generally added in supplements to dictionaries—because this cannot be done except in a roundabout and unsatisfactory way. As soon as a universal alphabet is adopted by representative scientific bodies, or authorized by law, or both, fonts of the new type will be found in almost every printing establishment, as italics now are, and linotype machines will be built to meet the new demand. First, the new alphabet would be used in the public prints for pronunciations, foreign proper names, etc. Then it would be taken up for international correspondence, for names of ships, for signboards of railway stations, streets in large cities, etc. It would speedily be used in international publications like those of the Bureau of American Republics.

It may be said further that the English-speaking student, after mastering 104 letters in his own language, besides numerals and marks (punctuating, diacritical and arbitrary) is still among the breakers near shore, if he incline to linguistics. For each European language that he takes up, he must learn another double alphabet for reading, or quadruple, if writing be added. This is true even when the Roman letters are used, for their phonic value is different from that given them in English. The Oriental languages are yet more difficult and complicated.

The objection that any change of alphabet—or of spelling, perhaps—will render the vast accumulations of literature, especially English, as difficult of access as if now in a foreign tongue, is met by the reply that the progress of printing is such as to insure the prompt publishing in the new way, of all that is valuable at least, whatever alphabet or spelling may be adopted. The improvement in machinery is so great and so rapid that the cost will not be excessive in all literature that interests the masses, and will probably decrease in a short time in those works that interest the scientific few. All the stores of the present time may still be studied by the patient searcher after truth with every advantage he now has. The general use of such universal alphabet would revolutionize the curricula of the common schools and of higher institutions as well. All of the time now wasted on the study of spelling could be devoted to some other branch that would be as effective for mental drill, and yet would be useful. Most of the time now devoted to reading—or, rather, its rudiments—in the elementary grades would be saved, to the gain of the pupil in actual knowledge. This would shorten the year of work in the common schools and enable pupils to enter high schools at an earlier age, or, perhaps, better still, would give the time needed for industrial training which is now not to be thought of. The high schools

and colleges would find the languages simplified, particularly in the elementary work.

It is not necessary now to determine when, where or by whom the universal alphabet shall be devised. It may be that a world's parliament can be held for consideration of this subject at some of the future international expositions. For the present it is sufficient to say that the linguist, the philologist, the oculist, the orthographer and other scientists should unite their learning to produce an alphabet which will be complete—which will correctly represent all the sounds of living tongues and dialects, and of the dead languages so far as can now be determined—which will be simple and pleasing in form, suitable for writing, printing and engraving—with capital and small letters alike, except in size, and with cursive, printed and engraved forms differing as little as possible, having due regard to their several needs and purposes; which shall minimize the strain on the eyes that comes from similarity of characters, hair lines, etc., and which shall blaze the way for an universal language that shall make feasible "the Parliament of Man, the federation of the world." The position of the vocal organs in producing the various sounds, from the full A(h) of Indo-European languages, to the Hottentot click, must be definitely determined and recorded. Then, with an universal system of punctuation and accent, any person who has once learned the alphabet will be able to read correctly any transliterated language, though he may not understand a word of it.

DIRECTIONS FOR MAKING "THE ROPE CYCLIST" LANTERN SLIDE.

By THEODORE BROWN.

Of the making of tricks and clever feats, certainly it can be said there is no end. When any new thing comes out that in any way lends itself as an accessory to some remarkable trick, it is certain to be eagerly and immediately seized upon by those whose self-appointed work it is to minister to the wants of those who are always ready to admire and applaud some feat requiring unusual skill and clever manipulation.

Thus, when the bicycle first came into general use as a means of locomotion, it was at once used for the performance of simple tricks; and as the bicycle has

FIG. 2.

been vastly improved in later years—almost beyond recognition, I might say—so has the number and nature of the clever tricks done by its aid been greatly altered also.

Now, it is quite a common trick among those high up in their particular profession to ride a single wheel in almost any position and at greatly varying rates on the stage, and there have not been wanting those who have combined tight-rope performances with these cycle tricks, and ridden their wheels across a suspended rope.

The particularly clever nature of the trick here described, and the simplicity with which it has been adapted and represented in a lantern slide, combine to make this a most effective slide. Without further introduction, I will proceed to the description of this slide.

It is sufficient to state that two glasses are employed, one being fixed and the other movable in a groove provided for it. Upon the same side of the sliding glass, 7 (Fig. 3), are glued two small blocks, 8 and 9,

FIG. 3.

in the positions shown. (I might here mention that the sliding glass is not represented its full length in this drawing, for the purpose of economizing space. It may be made almost any length, of course.)

Through these two blocks passes a thread, which is wound in its course once round a grooved wheel, which we shall presently have need to refer to in greater detail. The string is secured by means of knots. Upon this glass also are painted figures, as shown, representing the spectators around the ring of the circus, where the performance is supposed to be taking place. These figures are made somewhat larger near the ends, for the purpose of obtaining the right

perspective. 10 is the riding-master, always to be found in the ring when any performance is going on; 11 and 12 are the trestles, by means of which the rope is supposed to be suspended. In reality, of course, it is held by the blocks before mentioned.

We will now consider the fitting up of the fixed glass. This holds all the working parts, the wheel upon which the cyclist rides, and the cyclist himself. The component parts of the cyclist are cut out to the shapes shown in Fig. 2. All except the body, 2, are made of thin metal; 2 is made of thick wood. 1 represents the head and arms, which are in one piece. Flags are held in the hands for the purpose of balancing; 3 and 5 are the thighs and 4 and 6 the lower parts of the legs. 2 is, as we have just intimated, the body. 13 is a link connecting, as we shall see, the thigh, 5, with the head. The necessary holes must be bored in these parts in the places indicated in Fig. 2.

The body, 2, is then glued to the inner surface of

FIG. 4.

the fixed glass in its proper position, and the parts just described are pivoted and connected to it, as shown in Fig. 5. 1 is pivoted to the body, 3 and 5 are pivoted to the body at the same point, 4 and 6 are pivoted to the ends of 3 and 5 respectively, and the link, 13, is pivoted to 1 and 5, as shown.

Now, just below the body of the cyclist, a small block is glued to the fixed glass, as shown in the sectional diagram, Fig. 4. In this drawing, as will be seen, only the lower parts of the cyclist's body besides the wheel are shown. To this block is fastened a screw, represented by a dotted line, on which the grooved wheel before mentioned revolves. This wheel, which is, of course, that upon which the cyclist does his remarkable performance, bears a double crank, as shown in Fig. 4. This double crank passes through the holes made in the cyclist's feet.

Reference to Fig. 4 will show now the need for the greater thickness of the body. It is necessary in

FIG. 5.

order that the legs—between which, it should be mentioned, there is a small washer to keep them the proper distance apart—may be on the same level as the double crank on the wheel.

When the slide has been fitted up in the manner described it is completed, and ready for exhibition in the optical lantern. Let us see what happens when the sliding glass is pushed in and out.

Reference being made to Fig. 3, it will be seen that if the sliding glass is pushed from left to right, the wheel will revolve in a forward direction, because the thread stretched between blocks 8 and 9 (Fig. 3) passes around the periphery. Now, as the wheel revolves, the double crank, with the cyclist's legs attached, revolves too.

It will be easily understood, then (by reference to Fig. 4), that the cyclist's legs will go through the ordinary pedaling movements, and owing to the special kind of crank employed, they will cross each other as they would in real cycling. At the same time, the leg, 5 and 6 (Fig. 5), moving up and down will, by the agency of the connecting link, cause the head and arms to sway backward and forward in the act of balancing.

The spectators passing by the cyclist in direction opposite to that in which he appears to be traveling, will make it appear that he is really progressing; and as the spectators will get smaller and smaller until he gets to the middle of the rope, and larger and larger as he gets to his journey's end, it will seem as though he were going through his performance on a rope suspended in the middle of a circus ring. When he arrives at the trestle the operator may, by pulling the sliding glass back again, make the cyclist retrace his steps, or rather, re-ride his wheel across the rope, and thus considerably add to the effect.—The Optical Magic Lantern Journal and Photographic Enlarger.

GROUNDNUTS AND GROUNDNUT OIL.

It may be well to call the attention of importers and manufacturers to the statement of an American Consul relative to the importation and trade in groundnuts and the oil made from them.

According to him, the industry of the extraction of oil from seeds at Marseilles, which is more extensive than elsewhere in Europe, and is beginning to prosper, employs no special machine or process for the extraction of the oil from groundnuts different from that employed with other seeds, the extraction of this oil only occurring in favorable conditions of the market. The importation of groundnuts at Marseilles the last

year amounted to 70,000 tons. The crude oil ought to be filtered in order to be of a bright yellow; if it is desired to be white, it should be treated, it is said, with clay. What is to be feared with this oil is that it is very difficult to detect its presence when used for the adulteration of olive oil, because the reaction is white. The uses of arachio oil are numerous. It is recognized as the most polymorphous oil in existence.

The Consul who writes this is ignorant of the fact that for a long time an extensive and flourishing trade in groundnuts has been carried on at Marseilles, and we can add to his information by saying that the arachidic oil, pressed cold, is used as an edible oil, and is thus employed as an adulterant for olive oils. When it is prepared hot or from seeds more or less fermented, it serves for the manufacture of soap and for lubrication.

The arachide is the fruit of the *Arachis hypogea*, and a native of Brazil, but it is cultivated on a large scale in Senegambia, especially in Senegal and Guinea.

For a long period there has been a large consumption of the roasted nuts in America under the name of the pea-nut, and in France under that of the *cacahouet*.—Translated from Les Corps Gras Industriels.

RECLAIMING THE ZUIDER ZEE.

RATHER more than fifty years ago arose the idea of adding by the arts of peace a twelfth province to the kingdom of the Netherlands, says The Engineer. In 1849 the engineer, Van Diggelen, published a project for cutting off the Zuider Zee from the waters of the North Sea, and then the inclosed space was to be pumped dry. The project was worked out most elaborately, but it was shown that its execution was a practical impossibility. Van Diggelen wished to reclaim not only the large southern expanse of the Zuider Zee, which forms a seaboard for the very heart of Holland, but he was so ambitious as to entertain the project of reclaiming from the sea the region lying between the province of Friesland and the outlying fringe of the four islands of Texel, Vlieland, Terschelling, and Ameland. The eastern end of the enormous work would have been at the Lauwer Zee, at the very center of northern Holland. However, the idea was held to be impossible of accomplishment from a technical point of view, and the economic results were regarded as not likely to be sufficiently remunerative to pay the immense outlay necessary. A second and more modest project was brought forward in 1866 by Engineer Beyerinck; and in 1877 the Dutch Government commissioned M. van Stieltjes to draw up the necessary plans for draining the Zuider Zee, but owing to a change in the government the project was allowed to lapse. At last, in January, 1886, the "Zuiderzee-vereeniging" was established, with the idea of reclaiming the Zuider Zee. The association was well supported by the leading authorities in the five provinces which encircle the Zuider Zee, and it was joined by fifty-two parishes, sixty-four water guilds, and by many agricultural, trading, industrial and shipping societies, and also by great numbers of private individuals. The association then set to work, and for some years the general public could see but small results. The main part of this preparatory activity consisted at first in examining the nature of the soil underlying the waters of the Zuider Zee, and then in working out the practicability of the various details involved in carrying out the project. The leading engineer in charge of the project was M. Lely, who, curiously enough, happens to be Minister of Waterworks at this moment, and it has been reserved for him to lay before the Second Chamber a bill for "Cutting off and Draining the Zuider Zee." According to the plan drawn up by M. Lely, the work of draining the Zuider Zee will be undertaken mainly by the Zuiderzee-vereeniging, under the supervision of the State, and the State will be responsible for the necessary money.

The great work is to be carried out as follows: At first a dyke will be built from the northeastern point of the province of North Holland, and through the narrow Amstel Deep to the island of Wieringen. Thence the dyke will be constructed in a northeasterly direction to a point on the mainland near the village of Piaam, in the province of Friesland. Piaam is situated between the small towns of Makkum and Workum. When this dyke is built, the Zuider Zee will be cut off from the North Sea, and it will then be converted into an inland lake. So far as the actual reclamation of the Zuider Zee is concerned, two portions are for the present marked off for being dealt with. The first is that portion of it known as "De Meer," and it is contained by the coastline of the province of North Holland, the dyke, the island of Wieringen, and, finally, by a circular dyke, to be built from Wieringen in a huge curve toward the east and the south until the coastline of North Holland is reached again in the neighborhood of Medemblik. This portion is known as the "Northwest District." The second region, the southwestern, is bordered by the coastline of North Holland and by a circular dyke to be constructed from Blookershoek down to the northern shore of the Monnickendam Gat. The dyke to be built northward of Wieringen to the opposite coast of the province of Friesland will be 40 kilometers in length, and, as at present the coastline of the Zuider Zee has to be protected against the North Sea for a distance of 320 kilometers, there will be an immense saving in thus reducing these 320 kilometers to 40 kilometers. Near Kampen, the central point of the eastern coast line of the Zuider Zee, and four miles from its mouth, the silted up Yssel enters the Zuider Zee, and will bring a good supply into the projected fresh water lake. The province of Friesland has felt for many years the want of drinking water, which has often had to be obtained from England. Thus, Lake Yssel will take the place of the historic Zuider Zee, and it will receive the rainfall of five provinces around the coast line. Moreover, the construction of the dyke will put an end to the damage done to the coast line by the storms which at present rage upon the Zuider Zee. Finally, the summit of the dyke will be wide enough to admit of a line of rails being laid upon it; thereby North Holland will be brought into direct communication with Friesland, and the land journey from Amster-